the OCEAN-OGRAPHER

Introduction

Oceanographers are scientists who explore the oceans and study their phenomena. Until quite recently oceanographers were drawn from such general scientific disciplines as biology, physics, or chemistry. This was because in the past, few colleges offered degree programs specifically in the fields of oceanography or marine science. Today, however, there are many schools that offer advanced degrees in these and related areas.

Because the study of the oceans is an immense task, requiring the efforts of many kinds of scientists, the term "oceanographer" does not apply to only one scientific specialty. Oceanographers can be physicists or chemists, biologists or geologists. A distinction can be made, for example, between those scientists who study life in the oceans and those who concentrate on its physical makeup: the biological oceanographer and the physical oceanographer. Moreover, oceanographic activities in each area of specialization rely heavily on related areas. As an example, an oceanographer whose field is biology must have a sound background in physics and chemistry as well. At some point during your studies, usually at the graduate level, you will have to chose the branch of oceanography that interests you most.

Preparation and Training

It would seem logical to begin your training in college by majoring in oceanography, marine biology, or a related speciality. Most professional oceanographers, however, would discourage such an approach. If you are a high school student about to enter college and interested in oceanography, you can best prepare yourself by getting a firm background in one or more of the basic

sciences: chemistry, biology, physics, geology. It is equally important to take as many liberal arts courses as your schedule allows. Because a wide variety of research is carred out in countries around the world, a knowledge of foreign languages such as German, French, or Russian, can be a great help. English, reading skills, and the ability to write well are no less important.

Finally, a thorough knowledge of mathematics is required for virtually all the sciences, and a comprehension of data handling, computer programming, and statistical analysis is essential for scientific reporting. History, geography, and the social sciences are valuable in creating a strong foundation upon which later specialization can be built. You might also consider additional courses such as meteorology and climatology as part of your academic work.

Oceanography is a competitive field. A high academic standing and a strong general education are the best preparation. Undergraduates interested in furthering their knowledge of oceanography should be aware that there are many summer institutes that offer oceanographic courses. In sum, specialization should be avoided at the undergraduate level of your academic career.

Basic Job Description

Oceanographers collect, analyze and report on information concerning a wide variety of marine topics including those relating to ocean tides, currents, waves, temperature, salinity, and marine plants and animals. Those who want to do this kind of work must be prepared to spend long hours in the laboratory recording and analyzing test results and writing reports and research papers. Time must also be spent writing

proposals for funding to support the various research projects. For every hour spent at sea, many hours are spent ashore. In fact, although many oceanographers do go to sea, others, especially those who conduct their work in nearshore and coastal areas, never step aboard a large oceanographic research vessel.

Basically those who receive a doctorate in oceanography or related fields are those who initiate and oversee scientific research programs and are responsible for teaching or administration at the academic, governmental, or corporate level. Those who receive a master's degree will most likely be technicians who will give valuable support to senior investigators.

Many people have come to think that being an oceanographer is a glamorous occupation. Although the job is often exciting, there is also a great deal of time-consuming and tedious background work to be done in preparation for research projects on land or sea. Once on board a ship, physical stamina, creativity, imagination, and knowledge of the sea are all essential to make the cruise a success. Careful planning, preparation, and attention to detail are vitally important.

Some of the scientific research carried out on board research vessels and ashore typically includes the following:

Physical:

- Generation, propagation, and decay of surface waves in the Gulf Stream
- Underwater sounds of sea mammals off Bermuda
- Analyzing radioactive wastes in finfish
- Surface layer characteristics in the North Atlantic

Chemical:	Chemistry of trace elements in power plant discharges
	Chemical "finger printing" of oil from accidental spills
	Sulfate measurement in the Black Sea
Biological:	Prey - predator relationships in clams involving chemical detection of prey by predators
	Life cycles of marine copepods
	Reproduction, growth, and migration of blue crabs along Florida's Gulf Coast
	Ecosystem analysis - productivity of a New England salt marsh
	California kelp harvesting dynamics
Geological:	Exploration of active hot springs in the deep ocean floor in the Galapagos Rift Zone
	Geological studies of continental margins off the coast of southern New England
	Studies of deep-sea sedimentation, with special emphasis on mineralogy and geochemistry of deep-sea deposits in the Pacific Ocean

A Representative Sampling of Graduate Courses in Oceanography

General Oceanography
Ecological Aspects of Marine Pollution
Descriptive Physical Oceanography
Chemical Oceanography
Chemistry of the Marine Atmosphere
Geological Oceanography
Geomagnetism and Paleomagnetism
Marine Bacteriology
Benthic Environment
Biology of Marine Mammals
Petrology of the Oceanic Crust
Thermodynamics of the Earth's Interior
Physical Chemistry of Seawater
Animal Communications
Phytoplankton Taxonomy
Marine Invertebrates and Environment

Assistance in the preparation of this publication from the Marine Advisory Service Program, University of Rhode Island Sea Grant College is gratefully acknowledged.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration